CLAIMS

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is as follows:

1. A car rental system comprising:

a fleet of cars, each of which is operable only when a valid digital key is presented to the car, and each of said fleet of cars has a means to invalidate a digital key; and

a management system for handling reservation and car return, said management system including:

a key generation system for generating digital keys for renters of the car rental system;

a key return system for processing digital keys returned by renters.

2. The system in claim 1, further comprising a parking lot guarded by a security gate, said fleet of cars being parked with confines of said parking lot when not rented by a renter of the car rental system, said security gate only opening when a valid digital pass is presented by a renter of the car rental system.

3. The system in claim 1, wherein the management system is accessed by a prospective renter over a network and the prospective renter is given a digital key to operate a particular car and a digital pass to open the gate of the parking lot where said particular car is parked, after said prospective renter completes a reservation for said particular car, said digital key and digital pass being effective starting from the time specified by said reservation.

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1   4. The system in claim 3, wherein the prospective renter accesses the

2   management system at a kiosk located in the parking lot where the particular

3   car is parked.

1   5. The system in claim 3, wherein the prospective renter accesses the

2   management system over the Internet.

1   6. The system in claim 3, wherein the key generation system stores a digital

2   key on a storage device provided by a prospective renter.

1   7. The system in claim 6, wherein the storage device is a smart card.

1   8. The system in claim 6, wherein the digital key comprises car and user

2   identification (ID) signed by the management system to authenticate the

3   digital key.

1   9. The system in claim 1, wherein a renter of a car invalidates a valid digital

2   key upon returning a car to the car rental system and presents an invalidated

3   digital key to the key return system to complete a car return.

1   10. The system in claim 9, wherein the invalidation of a valid digital key

2   includes storing car status information relevant to computing by the key return

3   system a receipt for the renter.

1   11 . A computer implemented method for operating a car rental system

2   comprising the steps of:

3   accessing a reservation server by a prospective car renter to reserve a

4   car;

5   authenticating the prospective car renter by the reservation server and,

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6   upon the reservation server successfully authenticating the user, prompting the

7   prospective car renter for the date, time, and location for pickup and return,

8   and the type of car;

9   checking by the reservation server an availability of a requested car

10   and, if a car is available, creating by the reservation server a digital key by car

11   and user information with a digital signature of the reservation server; and

12   downloading the digital key to a portable storage device, the portable

13   storage device being used to gain access to a rental car.

1   12. The method in claim 11, wherein the step of accessing the reservation

2   server is performed via a network.

1   13. The method in claim 12, wherein the network is the Internet.

1   14. The method in claim 11, wherein the step of authenticating a prospective

2   car renter includes the steps of:

3   prompting the prospective car renter to enter a personal identification

4   number (PIN); and

5   comparing the entered PIN with a valid PIN for the prospective car

6   renter.

1   15. The method of claim 11, wherein the step of creating a digital key

2   comprises the steps of:

3   computing a hash of the car renter's valid PIN;

4   combining car and renter identification with the hashed PIN; and

5   digitally signing the combined information by said reservation server.

1   16. The method in claim 11, further comprising the steps of:

2   inserting the portable storage device by a car renter into a slot for

3 receiving the portable storage device in a rented car;

4 upon detecting the portable storage device inserted into the slot,

5 obtaining by an access controller installed in the rented car the digital key

6 stored on the portable storage device and checking by the access controller

7 whether the digital key is valid and verifying the signature on the digital key;

8 if the digital key is valid and the signature is verified, the access

9 controller then prompting the car renter to enter his or her identification and

10 checking for correctness of the car renter's identification; and

11 if the entered identification for the car renter matches a correct

12 identification on the portable storage device, the access controller activating

13 instruments of the car which the car renter is authorized to have access to.

1 17. The method in claim 16, further comprising the steps of:

2 upon receiving a car renter's request to return a car, prompting the car

3 renter to insert his or her portable storage device into the slot for the portable

4 storage device;

5 obtaining by the access controller car status information and car

6 identification;

7 creating by the access controller a return packet by combining car

8 status information and the current digital key;

9 signing the return packet by the access controller, appending the car

10 identification to the signed return packet, and saving the signed return packet

11 into the portable storage device; and

12 invalidating by the access controller a current digital key.

1 18. The method in claim 17, further comprising the steps of:

2 upon receiving a car renter's request to return a car, retrieving the

3 return packet from the portable storage device;

4 verifying a signature on the return packet; and

5   updating the car status and printing a receipt for the car renter.

1   19. The method in claim 11, wherein the portable storage device is a smart

2   card.

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